

**EXCLUSIVE PHOTOPRODUCTION OF $\psi(2S)$ IN
ELECTRON-PROTON COLLISION AT HERA**

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**FACULTY OF SCIENCE
UNIVERSITY OF MALAYA
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2012

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**DISSERTATION SUBMITTED IN FULFILMENT OF THE
REQUIREMENT FOR THE DEGREE OF
MASTER OF SCIENCE**

**DEPARTMENT OF PHYSICS
FACULTY OF SCIENCE
UNIVERSITY OF MALAYA
KUALA LUMPUR**

2012

ABSTRACT

The exclusive photoproduction of $\psi(2S)$ mesons, $\gamma p \rightarrow \psi' p$, has been studied in electron-proton collisions with the ZEUS detector at HERA, in the kinematic range of $30 < W < 170$ GeV, where W is the photon-proton centre-of-mass energy. The $\psi(2S)$ was reconstructed in the $J/\psi \pi^+ \pi^-$ decay channel where J/ψ was detected using the muon decay channel. The events data were taken from year 2003 to 2007 with the integrated luminosity of 354.18 pb^{-1} . The negative four-momentum squared of exchange photon, Q^2 were taken to be less than 1 GeV as the scattered electron remained undetected down the beampipe.

ABSTRAK

Pengeluaran dari photon bagi zarah meson $\psi(2S)$ secara eksklusif, $\gamma p \rightarrow \psi' p$ telah dikaji dalam pelanggaran electron-proton menggunakan detector ZEUS di HERA, dalam julat kinematik $30 < W < 170$ GeV, dimana W adalah pusat-jisim tenaga bagi photon-proton. Zarah $\psi(2S)$ dibina dalam saluran reputan $J/\psi \pi^+ \pi^-$ yang mana J/ψ pula dikesan menggunakan saluran reputan muon. Data peristiwa diambil dari tahun 2003 sehingga 2007 dengan sinaran integrasi 354.18 pb^{-1} . Empat-momentum kuasa dua negatif bagi pertukaran photon, Q^2 dianggap kurang dari 1 GeV memandangkan electron tersesar tidak dapat dikesan di dalam salur pancaran.

ACKNOWLEDGEMENT

First and foremost, thanks to Allah. I dedicate this thesis to my mother, Puan Saerah Bt Mohd Salleh, for her help, love and patience. Next, to my supervisor, Prof. Dr. Wan Ahmad Tajuddin Wan Abdullah, for all his guidance and patience. Not forgettable I dedicate this work to my former co-supervisor, Allahyarham Prof. Madya Dr. Burhanuddin Kamaluddin, ZEUS Collaboration members, UM Physics Department, ZEUSMal colleagues, all my family members, friends and everything inspired me. Last but not least, to Charlie. Thank you all.

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LIST OF SYMBOLS AND ABBREVIATIONS

Ψ' / ψ (2S)	Psi particle
J/ψ	J/psi particle
μ	Muon particle
π	Pi particle
2D	2-Dimensional
3D	3-Dimensional
BMUON	Barrel Muon Detector
BNL	Brookhaven National Laboratory
BRMUON	Barrel Rear Muon Detector
CAL	Calorimeter
CC	Charged Current
CTD	Central Tracking Detector
DESY	Deutch Elektronen Synchotron
DIS	Deep Inelastic Scattering
FMUON	Forward Muon
FTD	Forward Tracking Detector
GMUON	Global Muon System
GR	Grand Reprocess
HERA	Hadron Electron Ring Accelerator
MC	Monte Carlo
MIP	Minimum ionizing particle
MVD	Micro Vertex Detector
NC	Neutral Current
ORANGE	Overlying Routine Analysis of Ntuple Generation
PAW	Physics Analysis Workstation
PHP	Photoproduction

QCD	Quantum Chromodynamics
QED	Quantum Electrodynamics
RMUON	Rear Muon Detector
RTD	Rear Tracking Detector
SLAC	Stanford Linear Accelerator Center
SM	Standard Model
VM / VMs	Vector Meson / Vector Mesons
ZEVIS	Zeus Event Displays